

3. 4/15 find $f'(x)$ when

$$f(x) = \sin^2 x + \cos^2 x$$

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$$= 1 \quad \boxed{(\sin x)^2 + (\cos x)^2}$$

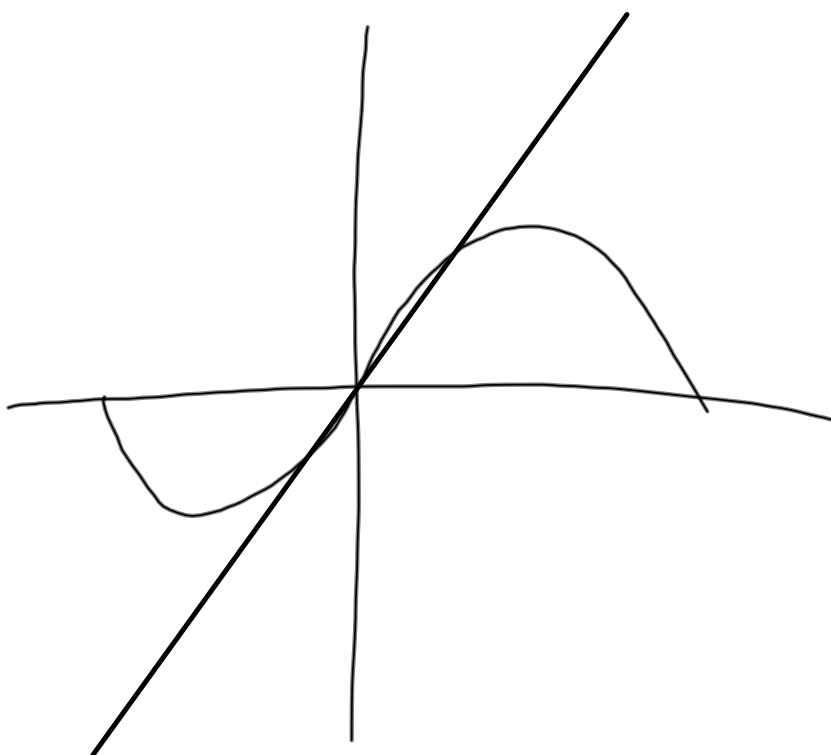
$$f'(x) = \frac{d}{dx}(1) \left(2(\sin x)'(\cos x) + 2(\cos x)'(-\sin x) \right)$$
$$= 0 \quad \quad \quad = 0$$

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x} = 0$$

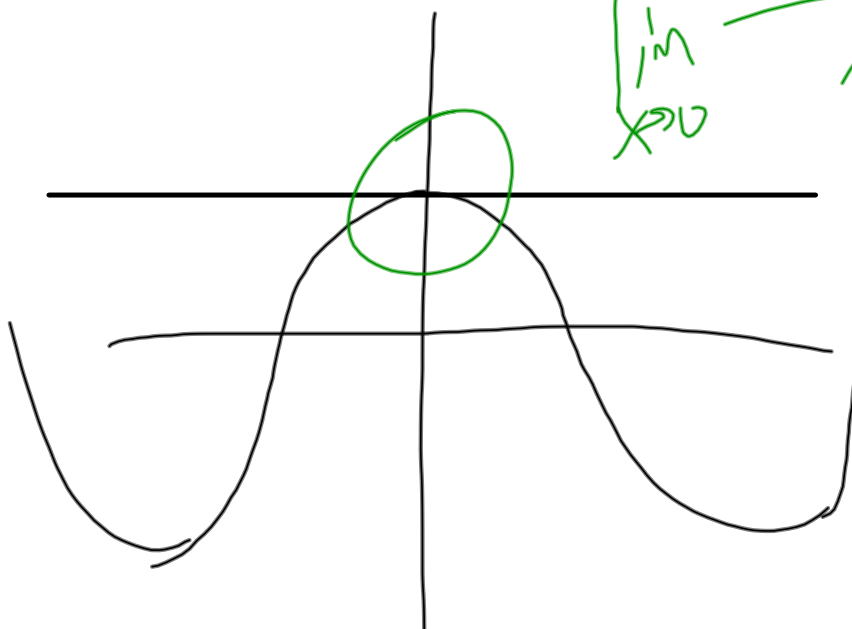
Q: what about

$$\lim_{x \rightarrow 0} \frac{1}{\frac{1 - \cos x}{x}} = \lim_{x \rightarrow 0} \frac{x}{1 - \cos x}$$

$$= \frac{1}{\lim_{x \rightarrow 0} \frac{1 - \cos x}{x}} \approx \frac{\text{nonzero}}{\text{zeroish}} \begin{cases} \text{DNE} \\ +\infty \\ -\infty \end{cases}$$



$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{x} = 0$$



$$3.7/4b \quad x^2 + y^2 = 2x$$

$$\left(\frac{d}{dt}\right) 2x \frac{dx}{dt} + 2y \frac{dy}{dt} = 2 \frac{dx}{dt}$$

$$(x-1) \frac{dx}{dt} + y \frac{dy}{dt} = 0$$

Given $\frac{dy}{dt} = 3$, $(x, y) = \left(\frac{2+\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$ find $\frac{dx}{dt}$

$$\left(\left(1 + \frac{\sqrt{2}}{2}\right) - 1\right) \frac{dx}{dt} + \frac{\sqrt{2}}{2} (3) = 0$$

$$\frac{dx}{dt} = \frac{-3 \frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} = -3 \frac{\sqrt{2}}{2} \cdot \frac{2}{\sqrt{2}} = -3$$

